phototype. This process does not fade as a photograph is liable to do, but has the consistency of print with the appearance of a steel engraving. By an ingenious method adopted by the author only one side of the bird's skeleton is given in the plate, and thus the confusion which is often seen in osteological illustrations from the appearance of the opposite side of the skeleton in the picture is obviated. The plates, which have been executed in Dresden at Mr. Wilhelm Hoffmann's Art Institute, deserve great credit for their execution. The letterpress which accompanies the figures gives the distinguishing characters of the skeletons with their principal measurements.

It is proposed to issue at least two parts in the course of every year, each part to contain ten plates. Out of the number hitherto published we find illustrations of seventeen Parrots belonging to fourteen genera, amongst them being the rare *Dasyptilus pesqueti* from New Guinea, the smallest known Parrot, *Nasiterna pygmæa*, as well as the largest one, *Microglossus aterrimus*, both of which are from New Guinea; *Nestor meridionalis* and *Stringops habroptilus* from New Zealand, besides illustrations of members of the following genera:—*Eclectus*, *Cacatua*, *Cyclopsitta*, *Loriculus*, *Trichoglossus*, *Charmosyna*, *Brotogerys*, *Tanygnathus*, and *Eos*. Of Birds of Paradise illustrations are given of *Cicinnurus regius*, *Paradisea minor*, *Manucodia chalybeata* with its twisted windpipe, along with those of its allies. Other Birds of Paradise are promised by Dr. Meyer. Among the Pigeons are figured species of *Carpophaga*, *Otidiphaps*, *Œdirhinus* and *Ptilopus*, side by side with skeletons and skulls of some of the domestic races. Of Kingfishers figures of the skeletons of the genera *Cittura*, *Tanysiptera*, and *Sauromarptis* are furnished, and among others we find illustrations of such interesting genera as the following:—*Pelenopides*, *Meropogon*, *Collocalia*, *Heteralocha*, *Rallina*, *Scissirostrum*, *Streptocitta*, *Oriolus*, *Dicrurus*, *Lepidogrammus*, &c.

We must draw the special attention of our readers to the skeleton of a species of *Notornis* from New Zealand, which Dr. Meyer has figured in Plates 34 to 37. This skeleton was procured along with the skin of the bird in South Island, N.Z., in the year 1879, and has found its way to the Dresden Museum. Complete figures of the osteology of this interesting genus are here given for the first time. Our national collection contains two skins of *Notornis*, but no skeleton, only some fossil remains from the North Island having been described and figured in the year 1848 by Prof. Owen. From a comparison of the latter with the skeleton now in the Dresden Museum, Dr. Meyer has been induced to consider that the North Island species is distinct from that inhabiting the South Island, and as the name of *Notornis mantelli* was given by Owen to the former bird, the specimen in the British Museum which came from the South Island must bear the name of *Notornis hochstetteri*, as Dr. Meyer proposes to attach to it the name of the well-known New Zealand explorer, Prof. von Hochstetter of Vienna.

A comparison is instituted by Dr. Meyer between the skeletons of different species of *Porphyrio* and *Ocydromus*. Together with the skeleton of the Jungle-fowl (*Gallus bankiva*), which Dr. Meyer himself brought from Sangi Island, north of Celebes, and different species of grouse (amongst them that of *Tetrao medius*), we find representations of the skeletons of several domesticated races of fowls. The importance of the characters presented by the differences of the crania and other portions of the skeletons of domestic fowls and pigeons was long ago proved by Mr. Darwin, and as there were only certain portions of the skeletons figured by him, the material which Dr. Meyer has collected with great care offers to the student a better opportunity of going deeply into this subject.

R. B. S.

THE "POTÉTOMÈTRE," AN INSTRUMENT FOR MEASURING THE TRANSPIRATION OF WATER BY PLANTS

IN view of the interest now attaching to recent advances in vegetable physiology, it seems not unlikely that a description of the instrument bearing the above name, lately published by Moll (*Archives Néerlandaises*, t. xviii.), will serve a useful purpose.[1] The apparatus was designed to do away with certain sources of error in Sachs's older form of the instrument, described in his "Experimental-Physiologie"—errors chiefly due to the continual alteration of pressure during the progress of the experiment.

As shown in the diagram, the "potétomètre" consists essentially of a glass tube, *a d*, open at both ends, and blown out into a bulb near the lower end; an aperture also

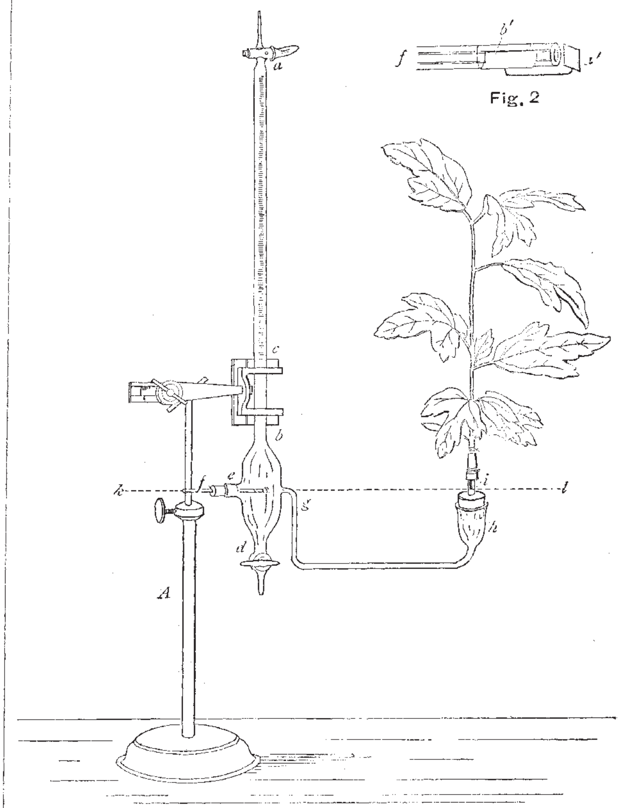

Fig. 2

Fig. 1

exists on either side of the bulb at or about its equator. The two ends of the main tube are governed by the stop-cocks *a* and *d*, and the greater length of the tube is graduated. A perforated caoutchouc stopper is fitted into one aperture of the bulb *e*, and a tube, *g h*, fits hermetically to the other. This latter tube is dilated into a cup at *h* to receive the caoutchouc stopper, into which the end of the shoot to be experimented upon is properly fixed.

The fixing of the shoot is effected by caoutchouc and wire or silk, as shown at *i*, and must be performed so that the clean-cut end of the shoot is exactly at the level of a tube passing through the perforated stopper, *e*, of the bulb; this is easily managed, and is provided for by the bending of the tube *g h*. The tube *f*, passing horizontally through the caoutchouc stopper *e*, is intended to admit bubbles of air, and so equalise the pressure and at the same time afford a means of measuring the rapidity of the absorption of water by the transpiring shoot. This tube

[1] Especially also with reference to Mr. F. Darwin's description of his own ingenious instrument (see NATURE, May 8, p. 7).

(see Fig. 2, f) is a short piece of capillary glass tubing, to which is fixed a thin sheath of copper, b', which slides on it, and supports a small plate of polished copper, a', in such a manner that the latter can be held vertically at a small distance from the inner opening of the tube, and so regulate the size of the bubble of air to be directed upwards into the graduated tube $a\ b$.

The apparatus is filled by placing the lower end of the main tube under water, closing the tubes f and i (with caoutchouc tubing and clips), and opening the stopcocks a and d. Water is then sucked in from a, and the whole apparatus carefully filled. The cocks are then turned, and the cut end of the shoot fixed into i, as stated: care must be taken that no air remains under the cut end at i, and the end of the shoot must be at the level $k\ l$. This done, the tube f may then be opened.

The leaves of the shoot transpire water, which is replaced through the stem at the cut end in i from the water in the apparatus. A bubble of air passes through the tube f, and at once ascends into the graduated tube $a\ c$. The descent of the water-level in this tube - which may conveniently be graduated to measure cubic millimetres—enables the experimenter at once to read off the amount of water employed in a given time.

It is not necessary to dwell on obvious modifications of these essentials, nor to speak of the slight difficulties of manipulation (especially with the tube f). Of course the apparatus might be mounted in several ways; and excellent results for demonstration in class could be obtained by arranging the whole on one of the pans of a sensitive balance. H. MARSHALL WARD

Botanical Laboratory, Owens College

AURORAL RESEARCHES IN ICELAND

IN my last communication to NATURE on the aurora borealis in Iceland (vol. xxix. p. 537), I mentioned that the unusually adverse state of the weather had frustrated my plan of erecting one of the "utströmnings" apparatus invented by Prof. Lemström for the production of the artificial aurora borealis (see NATURE, vol. xxvii. p. 389) on Mount Esja, 2500 feet in height, and about two geographical miles north-east from Reykjavik.

The greatest part of February passed too without showing any improvement, and the prospects of getting the apparatus in working order on the mountain whilst the Arctic night still reigned became smaller and smaller. Although I regretted this, the study of the aurora which I had observed during the winter had, as indicated in my last communication, gradually convinced me that such an apparatus, even at a great height above the level of the earth, would, at all events in this part of Iceland, give but a negative result.

In spite of the favourable position of the island, the electrical forces, for which the aurora borealis is a visible indicator, appear to possess exceedingly little energy and intensity here, which has particularly been the case during the past few months. In consequence I came to the conclusion that should even all my arrangements be carried out to perfection there was little prospect of producing the "artificial" aurora borealis here.

On February 22, however, a change in the weather set in, and we had a few lovely days with a clear sky, no wind, and a pleasant temperature. Now, if ever, the time had come for realising my plan; and as the weather held for three entire days I fixed the departure for noon of the 25th.

I was fortunate enough to be able to make the journey in pleasant company, two of the burghers of the town and two Englishmen engaged at some sulphur mines in the vicinity volunteering to accompany me to the top of the mountain. We started at about 10 a.m. in a large sailing boat, with the poles, wires, and the rest of the apparatus.

In about three hours we landed at the foot of Esja, and took up our quarters in the farm Mogilsau, from whence I despatched the crew in every direction to call up all able-bodied men to assist in bringing the materials up to the top. Already the same afternoon I had ten of the poles carried up to a height of about 1500 feet.

The next morning broke clear and fine, promising a day as fine as the previous one. I had then sixteen men at my disposal. They began work at 6 a.m., carrying the heavy things up the mountain, and at 9 the last were taken out of the boat, and we all followed upwards.

We ascended from the southern side of the mountain about two miles in length. Only now and then we found snow, otherwise the ground consisted of sand and gravel mixed with boulders. The incline is not very great at first, but at times hills and ridges are encountered which tax the muscles and the lungs severely enough. However, the first 2000 feet of the road were not difficult or dangerous; in fact the only part which could be called so were the last 500 to 600 feet. Here the mountain rises abruptly (Esja is formed in terraces), and was covered with a thin layer of snow having a dangerous ice-coating. It was impossible to proceed here without first having hewn steps in the ice.

At 11.20 we mounted the crest of Esja. The mountain stretched snowy-white to all sides as level as a floor. It brought to my mind my ascent of the North Cape last summer. There was a slight breeze blowing which made the air feel chilly. The thermometer showed in the sun at 1 p.m. $-1{\cdot}2^\circ$, at 2 $-0{\cdot}2^\circ$, and at 3, in the shade, $-3{\cdot}2^\circ$ Cels.

Every hand now became busy with erecting the apparatus. The layer of snow on the surface of the mountain was not thick enough to support the poles, and as the ground was frozen hard, they were—thirty-one in number—raised in cairns of large boulders, of which there were great quantities on the edge of the plateau. The poles being raised, the copper wires, along which there were fixed more than a thousand fine points, were suspended over the insulators on their tops. The wires were 850 feet in length, and the poles were erected in such a manner that square spiral slings were formed, having a distance of 6 feet from each other. The total surface area of the "utströmnings" apparatus is therefore 4100 square feet.

The work of erecting the apparatus occupied about four hours, and from the four barometrical observations I had an opportunity of making during the time—in conjunction with those which were, at my request, simultaneously, and with a similar instrument, effected at Reykjavik—I have fixed the height at which the apparatus stands at 2616 feet.

At 3.30 the descent began. The first part of this was far more risky than the ascent, as the steps cut became worn down and new ones had to be made. Simultaneously a very strong copper wire, carefully insulated by layers of canvas and indiarubber—the insulation being 6 mm. in diameter—was brought down the mountain by the shortest road, as far as it reached.

The next morning welcomed us with wind and heavy clouds, with a rapidly-falling barometer. The remaining poles were now brought up the mountain, and the bare telegraph wire, 3200 feet in length, carried to the spot where the insulated conductor ended. Both wires were connected in the most careful and exact manner, and the bare wire laid down as an ordinary telegraph wire on poles with insulators as far as it went. I had expected from its great length that it would reach down to the foot of the mountain, but it did not; it only reached to a height of 714 feet. When the wires in increasing rain and wind were laid out, I connected the end with two zinc disks one of which was placed in a small waterfall with heavy stones on it, and the other buried in the earth. When, finally, I had by means of a telephone and a gal-